The Economic and Phosphorus-Related Effects of Precision Feeding and Forage Management in North Cameroon

A. D. Nkengafac
University of Buea, Cameroon

P. Tinta
University of Buea, Cameroon

G. Ayuk
University of Buea, Cameroon

M. Mansue
University of Buea, Cameroon

F. Fuh
University of Buea, Cameroon

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A .D .Nkengafac , P .Tinta , G Ayuk , M .Mansue and F .Fuh .
Department of Animal Health , Faculty of Science , University of Buea , P .O .Box 63 Buea , Cameroon .
E-mail : nkengafacd@yahoo .com

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Background Structural best management practices have been implemented throughout the north province of Cameroon in an effort to reduce phosphorus (P) losses to the reservoir .Yet long-term water quality control efforts within north Cameroon are hindered by continuous P build-up in the soils resulting from dairy farm P imports exceeding exports .Addressing the P imbalance problems and maintaining economic viability of the farms requires a system-level redesign of farm management .One possible innovative strategy , precision feed management (PFM) , reduces soil-P build-up by limiting feed and fertilizer purchases , and increasing high-quality homegrown forage production .

Methods This study applied the integrated farm system model (IFSM) to two dairy farms in north Cameroon to quantify the benefits of a PFM farm planning strategy in controlling P imbalance problems , and maintaining farm profitability and reducing off-farm P losses .

Results The IFSM accurately simulated the 2 farms based on farm data supplied by farm planners ; these scenarios were used as the baseline conditions .The IFSM simulations of more accurate feeding of P (based on P required in animal diets) integrated with increased productivity of grass-forage and increased proportion of forage in the diet reduced the P imbalance of one farm from 5 .3 to 0 .5 kg/ ha and from 9 .6 to 0 .0 kg/ha for the second farm .For both farms , soluble P lost to the environment was reduced by 18% .Feed supplement purchases declined by 7 .5 kg/cow per year for dietary mineral P , and by 1 .04 and 1 .29 t/cow per year for protein concentrates through adoption of the PFM system .Moreover , when a land management practice of converting corn to grass was coupled with the precision feeding of P and improved forage management , IFSM predicted reductions of 5 .8 and 9 .3 kg/ha of converted land sediment-bound P in erosion loss each year .

Conclusions The model predicted slight purchase increases in corn grain to offset reductions in corn silage production and feeding rates , but no appreciable change in the farm P balance due to land conversion .The model-based studies conducted on a farm-by-farm basis complement farm planning efforts in exploring innovative farming systems .Moreover , the results set a benchmark for potential benefits of PFM strategies , economically and environmentally .